

Appln. No.: 10/005,241
Amendment dated December 24, 2003
Reply to Office Action of September 24, 2003

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A process for producing consolidated and densified multi-phase fibrous monolith components composite materials comprising:

combining a first ceramic powder with a first thermoplastic polymer binder and one or more processing aids to create a first uniformly suspended mixture;

combining a second ceramic powder with a second thermoplastic polymer binder the same as or different from the first thermoplastic polymer binder and one or more processing aids to create a second uniformly suspended mixture;

forming the first and second uniformly suspended mixtures into a composite materials feed rod including a central portion of the first uniformly suspended mixture and an outer portion of the second uniformly suspended mixture essentially surrounding the central portion;

extruding the composite materials feed rod to produce an extruded fibrous monolith filament; ~~and~~

forming a fibrous monolith preform from the extruded fibrous monolith filament;

heating the preform to a first temperature effective for removing the first and second thermoplastic polymer ~~binder~~ binders therefrom; and

heating the preform to a second temperature effective to consolidate and densify the preform at a pressure of between no more than about 1 to about 30 psi to provide [[a]] sintered fibrous monolith composite materials ~~component~~.

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2. (Previously Presented) The method of Claim 1 wherein at least one of the first or second uniformly suspended mixtures contains a sintering aid.

3. (Currently amended) A process for consolidation and densification of multi-phase fibrous monolith composite materials ~~elements~~ comprising:

placing ~~[[a]]~~ preformed fibrous monolith composite materials formed of one or more filaments each having a central portion of a first uniformly suspended mixture and an outer portion of a second uniformly suspended mixture essentially surrounding the central portion, wherein the second uniformly suspended mixture forms essentially a separate continuous phase between the central portion of the one or more filaments in the composite materials, in a sintering furnace, the sintering furnace containing an inert gas or nitrogen gas; and

heating the fibrous monolith composite materials at a pressure of between about 1 to no more than about 30 psi at a temperature effective to achieve full density of the first and second uniformly suspended mixtures and provide ~~[[a]]~~ sintered fibrous monolith composite materials.

4. (Currently amended) The process of Claim 3 wherein the fibrous monolith composite materials comprise ~~comprises~~ Si_3N_4 , BN, and a sintering aid.

5. (Currently amended) The process of Claim 3 wherein the fibrous monolith composite materials comprise ~~comprises~~ ZrC and WRe and are ~~is~~ heated to at least 2000 Celsius.

6. (Currently amended) A method for manufacture of an article comprised of ~~[[a]]~~ multi-phase fibrous monolithic composite materials comprising the steps of:

a) forming ~~[[a]]~~ fibrous monolithic composite materials ~~material~~ in the form of a filament and including a first material composition generally surrounded by a second material composition;

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b) compressing the fibrous monolithic composite materials filament to consolidate the material and densify the first and second material compositions;

c) forming the compressed fibrous monolithic composite materials filament into a preform of the fibrous monolithic composite materials article; and

d) sintering the preform in an inert atmosphere at generally atmospheric pressure at a temperature effective for providing an essentially fully dense, sintered fibrous monolithic composite materials article.

7. (Previously Presented) The process of Claim 1 wherein the second temperature is less than the lowest melting point of the first and second ceramic powders.

8. (Currently amended) The process of Claim 1 wherein at least one of the one or more processing aids combined with the first and second ceramic powders includes a plasticizer.

9. (Previously Presented) The process of Claim 2 wherein in the sintering aid is selected from the group consisting of yttrium oxide, aluminum oxide, silicon carbide, zirconium metal and hafnium hydride.

10. (Currently amended) The process of Claim 1 wherein the fibrous monolithic composite materials are ~~[[is]]~~ heated at about atmospheric pressure.

11. (Previously Presented) The method of Claim 1 wherein in the step of heating the preform to the second temperature the preform is initially heated to an interim temperature and held for a period of time before heating to the second temperature.

12. (Currently amended) The process of Claim 3 wherein the fibrous monolithic composite materials are ~~[[is]]~~ sintered at a temperature below the lowest melting temperature of the first and second uniformly suspended mixtures.

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13. (Currently amended) The process of Claim 3 wherein the fibrous monolith composite materials are ~~[[is]]~~ sintered at a temperature below at least one of the melting temperatures of the first and second uniformly suspended mixtures.

14. (Currently amended) The method of Claim 3 wherein in the step of heating the fibrous monolith composite materials the fibrous monolith composite materials are ~~[[is]]~~ initially heated to at least one interim temperature and held for a period of time before heating to the temperature effective for achieving full density.

15. (Previously Presented) The method of Claim 6 wherein the preform is sintered at a temperature below a lowest melting temperatures of the first and second material compositions.

16. (Previously Presented) The method of Claim 6 wherein the preform is sintered at a temperature lower than a melting temperature of at least one of the first and second material compositions.

17. (Currently amended) The method of Claim 6 wherein during sintering the pressure is between about 1 to no more than about 30 psi.

18. (Currently amended) The method of Claim 6 wherein in the step of sintering the fibrous monolith composite materials the fibrous monolith composite materials are ~~[[is]]~~ heated at a controlled rate to at least one interim temperature and held for a period of time.